N-63-2-5

PHILCO CORPORATION — Western Development Laboratories

In reply cite: 614-3-149
RWB/CSS/das
19 February 1963

SUBJECT: S/A 17 to AF04(695)-113
Submission of Technical Report WDL-TR2014

TO: Commander
Space Systems Division
Air Force Systems Command
United States Air Force
Air Force Unit Post Office
Los Angeles 45, California

ATTENTION: Technical Data Center

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REFERENCES: (a) AF04(695)-113, S/A 17 to Exhibit "B", Para. 3.1
(b) AF04(695)-113, S/A 17 to Exhibit "C", Item 2 and 10
(c) AFBM Exhibit 58-1, Para. 2.2 and 2.13

In accordance with the requirements of references (a), (b), and (c), we are forwarding ten (10) copies of the following document:

Title	Number and Date
Program 823 Progress and Security (1 January - 31 January 1963)	WDL-TR2014 20 February 1963

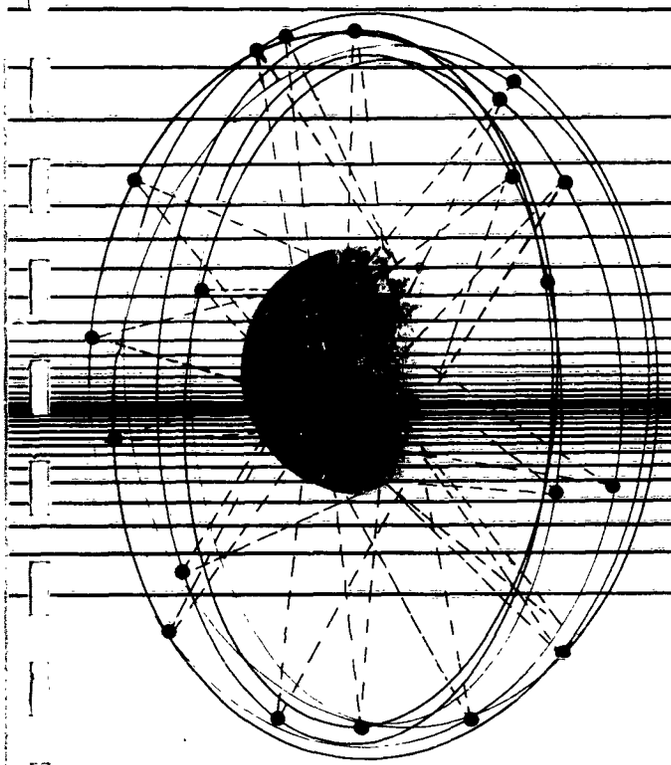
PHILCO CORPORATION
Western Development Laboratories

R. W. Boyd
Manager, Contracts Management

CONTRACT STATUS REPORT

WDL-TR2014

20 FEBRUARY 1963



PROGRAM 823 PROGRESS AND SECURITY (1 JANUARY - 31 JANUARY 1963)

PREPARED FOR:

AIR FORCE SPACE SYSTEMS DIVISION
AIR FORCE SYSTEMS COMMAND
UNITED STATES AIR FORCE
INGLEWOOD, CALIFORNIA

S/A 17 TO D/C AF04(695)-113

PHILCO
A SUBSIDIARY OF Ford Motor Company

WESTERN DEVELOPMENT LABORATORIES
PALO ALTO, CALIFORNIA

WDL-TR2014
20 February 1963

CONTRACT STATUS REPORT

PROGRAM 823 PROGRESS AND SECURITY (1 January - 31 January 1963)

Prepared by

PHILCO CORPORATION
Western Development Laboratories
Palo Alto, California

S/A 17 to AF04(695)-113

Prepared for

SPACE SYSTEMS DIVISION
AIR FORCE SYSTEMS COMMAND
UNITED STATES AIR FORCE
Inglewood, California

ABSTRACT

PHILCO WDL-TR2014 UNCLASSIFIED

PROGRAM 823 PROGRESS AND SECURITY (1 January - 31 January 1963)

20 pages

20 February 1963 S/A 17 to AF04(695)-113

This report discusses Program 823 progress as defined under "Contractor Tasks" of Exhibit "B" to Letter Contract Designated Supplemental Agreement No. 17 to Contract AF04(695)-113.

Section 1 contains specification status and program schedules. Section II contains the narrative for the Program and for Station Integration.

THIS UNCLASSIFIED ABSTRACT IS DESIGNED FOR RETENTION IN A STANDARD 3-BY-5 CARD-SIZE FILE, IF DESIRED. WHERE THE ABSTRACT COVERS MORE THAN ONE SIDE OF THE CARD, THE ENTIRE RECTANGLE MAY BE CUT OUT AND FOLDED AT THE DOTTED CENTER LINE. (IF THE ABSTRACT IS CLASSIFIED, HOWEVER, IT MUST NOT BE REMOVED FROM THE DOCUMENT IN WHICH IT IS INCLUDED.)

FOREWORD

This document is one in a series of Contract Status Reports under Letter Contract Designated Supplemental Agreement 17 to Contract AF04(695)-113.

This report is submitted in accordance with Para. 2.2 and 2.13 of AFBM Exhibit 58-1, Contractor Reports Exhibit, dated 1 November 1959, as revised and amended; Para. 3.1 of Exhibit "B" to S/A 17, and Items 2 and 10 of S/A 17 to Exhibit "C".

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

THIS REPORT DISCUSSES PROGRAM 823 PROGRESS AS DEFINED UNDER "CONTRACTOR TASKS" OF EXHIBIT "B" TO LETTER CONTRACT DESIGNATED SUPPLEMENTAL AGREEMENT NO. 17 to CONTRACT AF04(695)-113.

A. PROGRAM PROGRESS

SECTION I

SCHEDULES

SECTION 1
SCHEDULES

1.1 SPECIFICATION STATUS

The status of active specifications as of 31 January 1963 is shown on pages 1-2 through 1-6.

1.2 PROGRAM SCHEDULES

A schedule for Program 823 activity is shown on page 1-7.

APPLICABLE SUBSYSTEM SPECIFICATIONS

NUMBER	RELEASE DATE	DESCRIPTION	SUBMITTAL REFERENCE	INFORMATION DATE	ESTIMATED SUBMITTAL	REMARKS
98-2043B-09	15 OCT 62	MUSAP RADAR TRACKING	614-3-146	25 OCT 62		SSD APPROVAL (20 Nov 62)
APPENDIX A	15 OCT 62		614-3-137	22 OCT 62		SSD APPROVAL
AMENDMENT 1	13 NOV 62		614-3-203	14 NOV 62	14 NOV 62	SSD APPROVAL
98-2045C-09	16 AUG 62	MUSAP TELEMETRY GROUND	614-3-38	31 AUG 62		AWAITING APPROVAL
AMENDMENT 1	16 AUG 62	STATION (FM/FM)	614-3-45	23 AUG 62		AWAITING APPROVAL
AMENDMENT 2	20 DEC 62		614-3-347	31 DEC 62	23 NOV 62	AWAITING APPROVAL
AMENDMENT 3	31 Jan 63				11 FEB 63	
AMENDMENT 4	31 Jan 63				11 FEB 63	
98-2046B-09	5 NOV 62	MUSAP DATA HANDLING	614-3-187	5 NOV 62		AWAITING APPROVAL
AMENDMENT 1	8 DEC 62		614-3-292	12 DEC 62		AWAITING APPROVAL
*APPENDIX A						
98-2047A-09	23 NOV 62	MUSAP TIMING	614-3-262	3 DEC 62	3 DEC 62	AWAITING APPROVAL
AMENDMENT 1	3 DEC 62		614-3-298	13 DEC 62	13 DEC 62	AWAITING APPROVAL
AMENDMENT 2	7 DEC 62		614-3-313	17 DEC 62	17 DEC 62	AWAITING APPROVAL
AMENDMENT 3						

APPLICABLE SUBSYSTEM SPECIFICATION (Cont'd)

NUMBER	RELEASE DATE	DESCRIPTION	SUBMITTAL INFORMATION REFERENCE	SUBMITTAL INFORMATION DATE	ESTIMATED SUBMITTAL	REMARKS
98-2048A-09	10 AUG 62	MUSAP CONTROL AND DISPLAY	614-3-28	16 AUG 62		CONDITIONAL APPROVAL
AMENDMENT 1	22 OCT 62		614-3-169	31 OCT 62		AWAITING APPROVAL
AMENDMENT 2	26 NOV 62		614-3-276	6 DEC 62	16 NOV 62	AWAITING APPROVAL
AMENDMENT 3	27 NOV 62		614-3-276	6 DEC 62	6 DEC 62	AWAITING APPROVAL
AMENDMENT 4	13 DEC 62		614-3-322	20 DEC 62	20 DEC 62	AWAITING APPROVAL
AMENDMENT 5	16 JAN 63			24 JAN 63	21 JAN 63	AMD 5 TO SUPERSEDE
98-2049A-09	3 DEC 62	MUSAP CHECKOUT	614-3-289	11 DEC 62	30 NOV 62	AWAITING APPROVAL
AMENDMENT 1	3 DEC 62		614-3-309	17 DEC 62	17 DEC 61	AWAITING APPROVAL
98-2073-09	15 JUN 62	MUSAP 200 MC TRACKING	624-3-177	22 JUN 62	22 JUN 62	NOTE 3- 27 JUN 62 APPROVED
AMENDMENT 1	25 OCT 62		614-3-168	31 OCT 62	31 OCT 62	11 DEC 62 APPROVED
*98-2203-09	4 JAN 63	IOS ALIGNMENT AND CALIBRATION	614-3-8	7 JAN 63	10 JAN 63	NOTE 1 AWAITING APPROVAL

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APPLICABLE SUBSYSTEM SPECIFICATION (Cont'd)

NUMBER	RELEASE DATE	DESCRIPTION	SUBMITTAL INFORMATION REFERENCE	SUBMITTAL INFORMATION DATE	ESTIMATED SUBMITTAL	REMARKS
*98-2207-09	4 JAN 63	IOS INTRASTATION COMMUNICATIONS			45 DAYS AFTER APPROVAL OF COMM PLAN	
*98-2183-10		IOS STATION SYSTEM			15 JAN 63	NOTE 2 NOT STARTED
*98-2187-09 AMENDMENT 1	7 DEC 62	TELEMETRY, TRACKING AND COMMAND (TT&C)	614-3-229	7 NOV 62	7 NOV 62 24 JAN 63	AWAITING APPROVAL
98-2186-09		HTS TRACKING, TELEMETRY AND COMMAND (TT&C)			7 FEB 63	NOTE 1

APPLICABLE SUBSYSTEM SPECIFICATION (Cont'd)

NUMBER	RELEASE DATE	DESCRIPTION	SUBMITTAL INFORMATION REFERENCE	SUBMITTAL INFORMATION DATE	ESTIMATED SUBMITTAL	REMARKS
98-2180-10		HTS PROGRAM 823 SYSTEM			7 FEB 63	NOTE 2
98-1882C-09		VTS TRACKING DOPPLER DATA ACQUISITION			14 FEB 63	NOTE 1
98-2181-10		VTS PROGRAM 823 STATION SYSTEM			21 FEB 63	NOTE 2
WDL-ES-1512A AMENDMENT 2	14 FEB 61 17 JAN 62	NHS ALIGNMENT AND CALIBRATION EQUIPMENT		24 FEB 61 29 JAN 62	NONE	10 APRIL 61 APPROVED SSD APPROVAL: USE AS IS - APPROVED 11 MAY 62

APPLICABLE SUBSYSTEM SPECIFICATION (Cont'd)

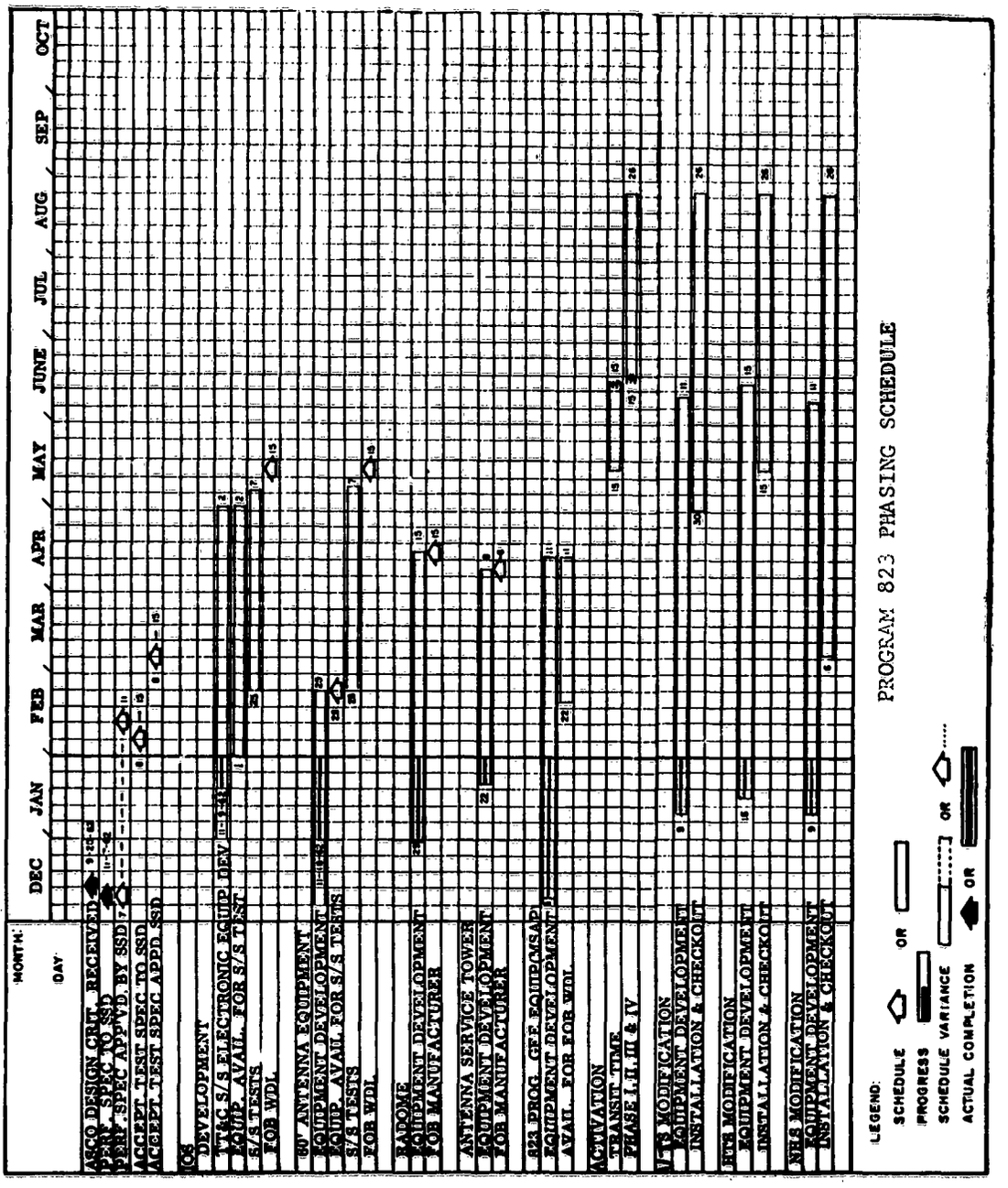
NUMBER	RELEASE DATE	DESCRIPTION	SUBMITTAL INFORMATION		ESTIMATED SUBMITTAL	REMARKS
			REFERENCE	DATE		
98-1887C-09		NHS TRACKING DOPPLER DATA ACQUISITION			7 FEB 63	NOTE 1
98-2182-10		NHS PROGRAM 823 SYSTEM			14 FEB 63	NOTE 2

NOTE 1: ESTIMATED SUBMITTAL DATES ARE FOR PERFORMANCE ONLY; A/T PORTION WILL BE SUBMITTED APPROXIMATELY 60 DAYS PRIOR TO WDL SUBSYSTEM ACCEPTANCE TEST DATE.

NOTE 2: ESTIMATED SUBMITTAL DATE FOR PERFORMANCE REQUIREMENTS ONLY; A/T PORTION WILL BE SUBMITTED APPROXIMATELY 60 DAYS PRIOR TO START OF PHASE IV TESTING.

NOTE 3: DELETED BY TERMINATION DOCKET NO. SG-057

*IOS PECULIAR



PROGRAM 823 PHASING SCHEDULE

SECTION 2

NARRATIVE SUMMARY

2.1 PROGRAM 823

2.1.1 System Design and Development

WDL-TR1954, "Program 823 Plan, Modifications at NHS, VTS, and HTS," was reviewed with SSD and Aerospace personnel on 16 January. As a result, the following technical program management decisions were made:

1. The interim command capability recommended by WDL was amended by the agreement that should extensive 400-mc noise be generated by 1-kw, 375-mc transmission, the power output of the transmitter could be reduced to 100 or 200 watts.

2. It was agreed that lowering the HTS system noise figure to 320°K would be acceptable depending upon antenna performance.

3. The number of 375-mc transmitters at VTS, NHS, HTS will be reduced from two units to one unit, and one radiated command detector per transmitter will be provided.

4. Philco will provide one Doppler data converter at VTS, NHS and HTS.

5. Transverse lock modifications will be eliminated under the modifications for the T&D antenna at VTS and NHS.

6. One biphase modulator will be provided at VTS and NHS.

Philco WDL initiated a compatibility test plan for the TT&C subsystem. Tests are to be performed at Philco and will include examination of transmission line and transmission line components to determine their susceptibility to the generation of 400-mc noise when subjected to 1-kw power at 375 mc. Tests described in this plan are scheduled for initiation in February.

Preparation of the acceptance test portion of the TT&C subsystem specification was initiated.

A reliability station model for IOS was developed based upon the current IOS station configuration. The resulting computations reflect a WDL assumed station demand in lieu of complete definition of station demands not yet received from Aerospace.

An analysis of Doppler counting techniques was completed. This analysis studied three techniques:

- Fixed period Doppler cycle count (Advent type)
- Fixed period Doppler frequency times eight count (461 technique)
- Fixed count variable period determination.

The analysis supported WDL's earlier contention that the last method provides substantially better counting accuracy, while not causing increased equipment complexity. This technique is well adapted to both low altitude and high altitude satellites. The Advent technique is being currently implemented by SSD/ASCO direction.

2.1.2 Ground Equipment (See Figs. 2-1, 2-2, 2-3, and 2-4)

Tracking, Telemetry and Command (TT&C) Subsystem. It was proposed to SSD that an interim 375-mc command capability be established at NHS and VTS in the event that operational down-time could not be scheduled for accomplishment of the antenna modifications.

Approval of Subsystem Specification WDL 98-2187-09 has not yet been received. The functional test portion of this specification, not initially submitted, has been completed and is scheduled for submission in February as Amendment 1 to the original specification. Exceptions to the basic specification may necessitate revision of both the performance and functional test sections. Acceptance test procedures, based on the performance requirements of the basic specification as well as the functional test requirements of Amendment 1, are being formulated.

Preshipment test preparation continues; test space requirements have been met by the use of existing permanent facilities. The simultaneous testing of the TT&C subsystem and Multi-Satellite Augmentation Program subsystems required some adjustment and sharing of facilities.

Delivery of the 110-ft. radome for IOS has been rescheduled one month later than originally planned. This decision was reached after considering the revised BOD date, and cost reduction factors.

Alignment and Calibration Subsystem. The IOS Alignment and Calibration Subsystem Specification, WDL 98-2203-09, has been released and forwarded to SSD. This specification was reviewed with Aerospace Corporation personnel at WDL on 18 January 1963 with the result that a revision to the specification is being prepared. This revision includes deletion of the boresight camera assembly as a part of this subsystem.

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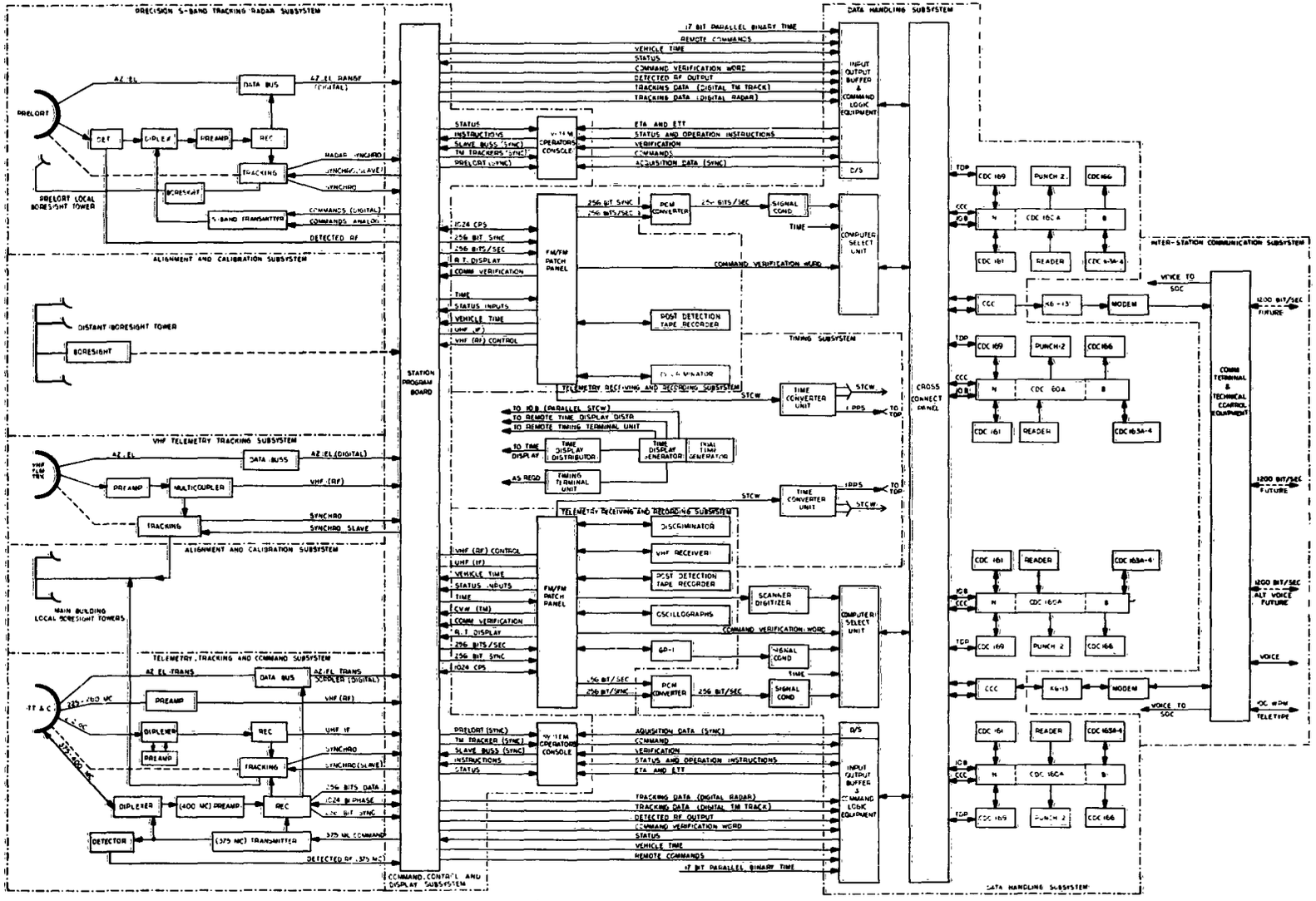

Fig. 2-1 Indian Ocean Station Block Diagram

WESTERN DEVELOPMENT LABORATORIES

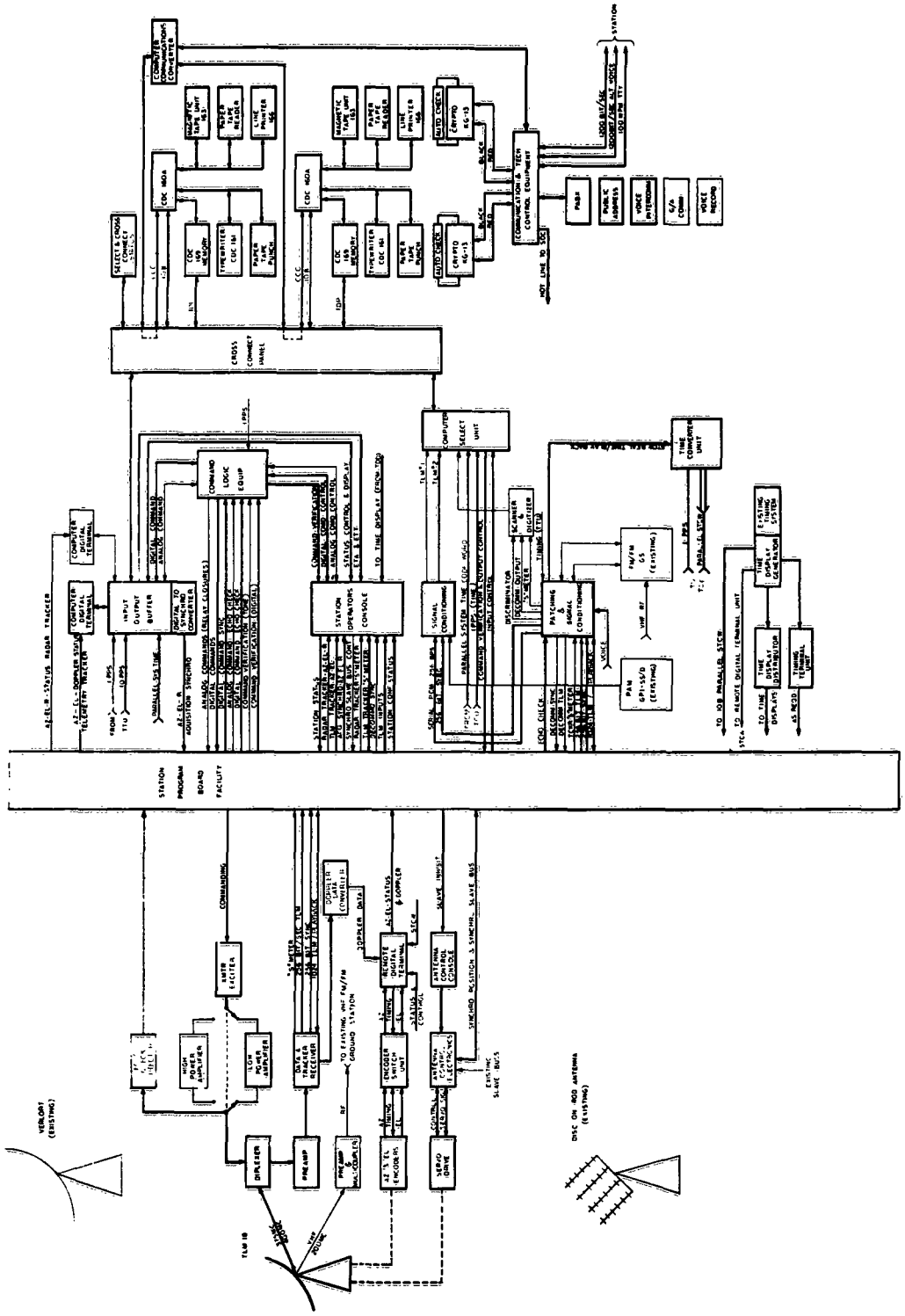

Fig. 2-2 Hawaii Tracking Station Modified for Program 823

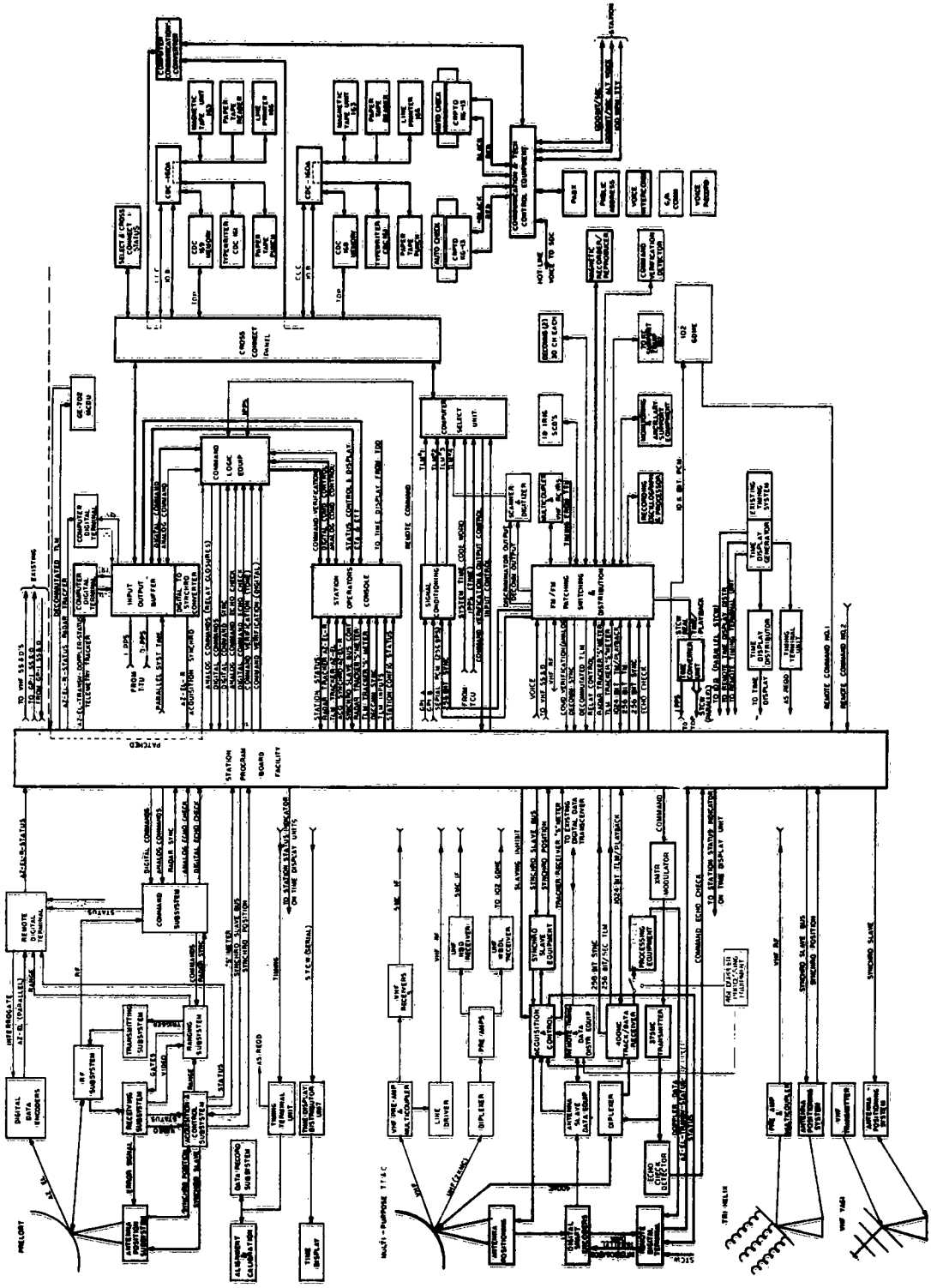

Fig. 2-3 New Hampshire Station Modified for Program 823

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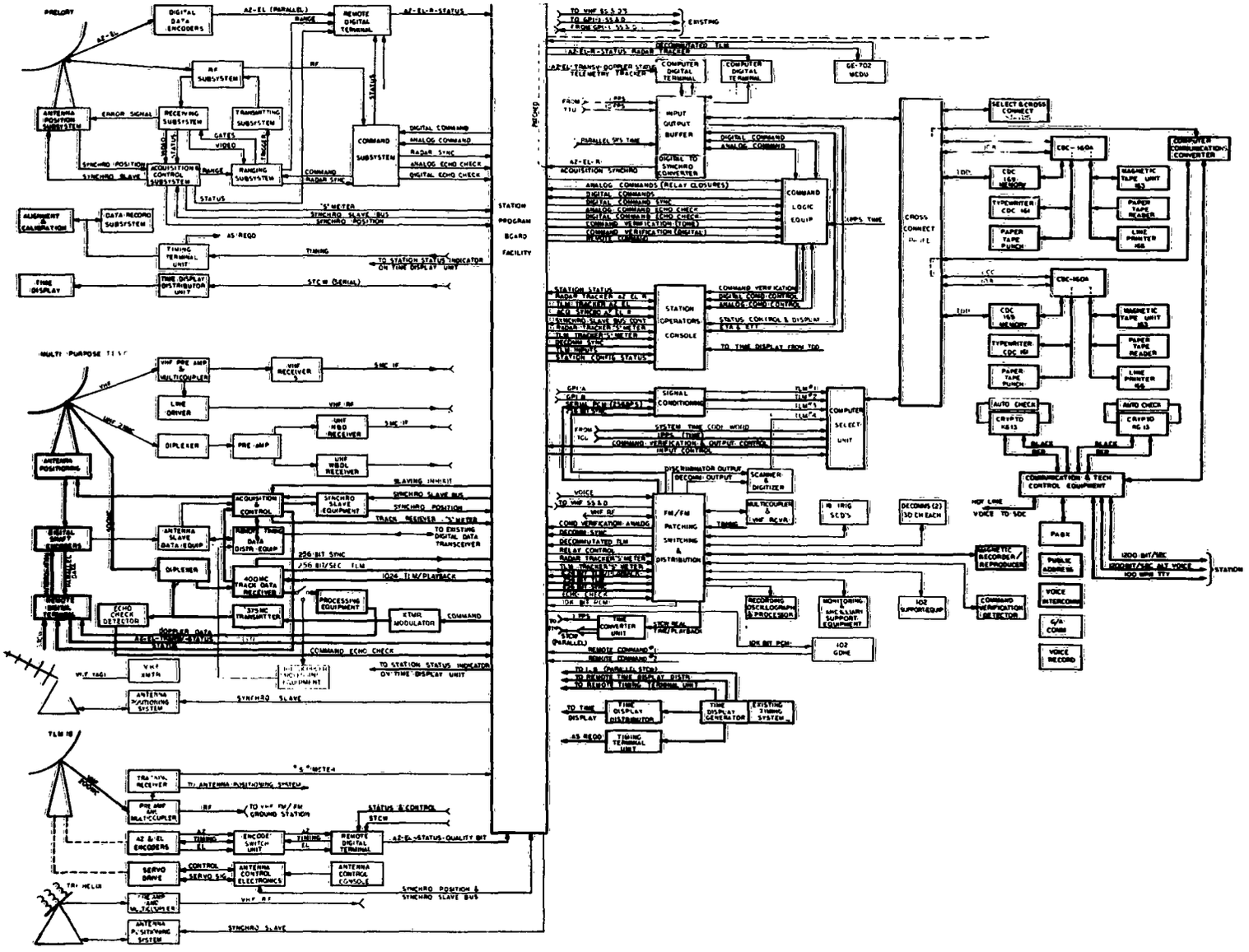

Fig. 2-4 Vandenberg Tracking Station Modified for Program 823

WESTERN DEVELOPMENT LABORATORIES

Intrastation Communications Subsystem. Drafts of procurement specifications and work statements for acquisition of the public address, operational voice communication, and voice recording equipment have been completed and are being reviewed. Upon approval of the Intrastation Communications Plan, WDL-TR1955, procurement of this equipment will be initiated.

Data Handling Subsystem. A decision has been reached that a new Doppler data converter will be provided for HTS instead of modifying the existing Advent tracking data processor. This decision was made after considering time and cost factors.

The method of accomplishing interface between the data handling and TT&C subsystems in the command logic area has been defined. This definition requires modification of the RDT's.

2.1.3 Station Design and Planning

The IOS site survey is continuing.

2.1.4 Human Factors

Man-Machine Design. WDL-TR2016, "Program 823, Human Engineering Plan," will be submitted to SSD approximately 1 March 1963.

Maintainability Assurance. WDL-TR1996, "Maintenance Concept for the Indian Ocean Station," dated 10 January 1963, was submitted to SSD.

2.1.5 Reliability

General. Philco WDL personnel participated in a design review at the vendor's facility for the UHF telemetry Doppler angle tracking receiver. The reliability review indicated that design concepts, circuit configurations, and parts choices are adequate.

The preliminary reliability concept review, and predictions, were completed for the 60-ft TT&C antenna. This review included the pedestal, r-f components, hydraulic system and servo control circuitry, and indicated that the present design will yield an inherent MTBF of 168 hours as compared to the allocated goal of 130 hours.

An ASCO request for reliability data was answered in part by TWX No. 128-17, dated 28 January 1963. The remaining information will be submitted on 5 February.

Technical Reports. WDL-TR2011, "Program 823 Value Engineering Plan," dated 31 January 1963; and WDL-TR2012, "Program 823 Reliability Program Plan," dated 31 January 1969, were submitted to SSD.

2.1.6 Problem Areas

Approval of subsystem specification WDL 98-2187-09 has not yet been received (See Para. 2.1.2).

2.2 STATION INTEGRATION

2,2,1 Installation Integration

Activation Plan. Integration Contractor Schedule No. 604A for IOS and modifications at NHS was delivered to SSD and Aerospace on 24 January.

Station Control. Coordination was accomplished with LMSC on equipment location and delivery for MUSAP and Program 823 at VTS and HTS.

B. SECURITY

Negative report.

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